
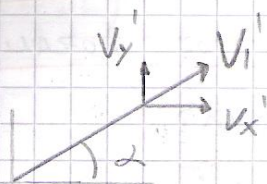


① PÁG. 16

$$V_A = 2 \text{ m/s}$$

$$m_A = 50 \text{ kg}$$

(A) 



$$V_{x'} = V_{1'} \cdot \cos \alpha$$

$$V_{y'} = V_{1'} \cdot \sin \alpha$$

 $m_B = 70 \text{ kg}$

$$\uparrow V_B = 1,5 \text{ m/s}$$

(Y) ~~$m_{Ax} \cdot V_{Ax} + m_{By} \cdot V_{By} = V_{y'} (m_A + m_B)$~~ — DIVIDAS

(X) ~~$m_{Ax} \cdot V_{Ax} + m_{By} \cdot V_{By} = V_{x'} (m_A + m_B)$~~

$$\frac{m_{By} \cdot V_{By}}{m_{Ax} \cdot V_{Ax}} = \frac{V_{y'} \sin \alpha}{V_{x'} \cos \alpha}$$

$$\frac{m_{By} \cdot V_{By}}{m_{Ax} \cdot V_{Ax}} = \tan \alpha \Rightarrow \frac{1,5 \text{ m/s} \cdot 70 \text{ kg}}{2 \text{ m/s} \cdot 50 \text{ kg}} = \tan \alpha \Rightarrow \frac{105}{100} = \tan \alpha$$

$$\alpha = 46^\circ$$

$$m_{Ax} \cdot V_{Ax} = V_{x'} (m_A + m_B) \Rightarrow \frac{m_{Ax} \cdot V_{Ax}}{m_A + m_B} = V_{x'} \Rightarrow V_{x'} = 0,83$$

$$V_{x'} = V_{1'} \cdot \cos \alpha \Rightarrow V_{1'} = \frac{V_{x'}}{\cos \alpha} \Rightarrow \boxed{V_{1'} = 1,19 \text{ m/s}}$$

$$\Delta E_c = E_{cf} - E_{ci}$$

$$\Delta E_c = \left[\frac{1}{2} (m_1 + m_2) (V_{1'})^2 \right] - \left[\frac{1}{2} m_1 (V_A)^2 + \frac{1}{2} m_2 (V_B)^2 \right] \Rightarrow$$

$$\Delta E_c = [84,96 \text{ J}] - [100 \text{ J} + 78,75 \text{ J}] \Rightarrow$$

$$\Delta E_c = 84,96 \text{ J} - 178,75 \text{ J} = \boxed{\Delta E_c = -93,79 \text{ J}}$$

$$\textcircled{15} \quad \omega = \frac{P}{F} \Rightarrow \omega = \frac{14 \text{ W}}{5 \text{ N}} \Rightarrow \omega = 2,8 \text{ m/s} \quad P = 14 \text{ W}$$

$$P = \frac{W}{\Delta t} \Rightarrow W = P \cdot \Delta t$$

$$F = 5 \text{ N}$$

$$\Delta t = 7 \text{ s}$$

$$\Rightarrow W = 14 \text{ W} \cdot 7 \text{ s}$$

$$\Rightarrow W = 98 \text{ J} \quad /$$

CHOQUE

①

$$V_1 = 6 \text{ m/s}$$

$$V_2 = 3 \text{ m/s}$$

$$V_1' = ? \quad \text{D'APRÈS} \quad V_2' = ?$$



$$m_1 = 4 \text{ kg}$$

$$m_2 = 6 \text{ kg}$$

$$k = 0$$

$$m_1 V_1 + m_2 V_2 = (m_1 + m_2) V_1'$$

$$\textcircled{1} \quad m_1 V_1 + m_2 V_2 = (m_1 + m_2) V_1'$$

$$V_1' = \frac{m_1 V_1 + m_2 V_2}{m_1 + m_2} \Rightarrow V_1' = \frac{24 \text{ kg m/s} + 18 \text{ kg m/s}}{10 \text{ kg}} \Rightarrow V_1' = 4,2 \text{ m/s}$$

$$\Delta E_c = E_{cf} - E_{ci}$$

$$\frac{1}{2} (m_1 + m_2) V_f^2 - \left(\frac{1}{2} m_1 V_{10}^2 + \frac{1}{2} m_2 V_{20}^2 \right) = \Delta E_c$$

$$(5 \text{ kg} \cdot 17,64 \text{ m/s}^2) - (72 \text{ kg m/s}^2 + 27 \text{ kg m/s}^2) = \Delta E_c$$

$$88,2 - 99 = \Delta E_c$$

$$\Delta E_c = 10,8 \text{ J} \quad /$$

$$V_2' (m_1 + 1)$$

ANSWERS

DISCUSSION

2

$$V = 6 \text{ m/s}$$



$$m = 4 \text{ kg}$$

$$V = 3 \text{ m/s}$$



$$m = 6 \text{ kg}$$

$$V_1' = ?$$



$$m = 4 \text{ kg}$$

$$V_2' = ?$$



$$m = 6 \text{ kg}$$

$$K = 1 \quad m_1 V_1 + m_2 V_2 = m_1 V_1' + m_2 V_2' \quad (1)$$

$$K = -\frac{(V_1' - V_2')}{V_1 - V_2} \Rightarrow K = \frac{-V_1' + V_2'}{V_1 - V_2} \Rightarrow V_1 - V_2 - V_2' = -V_1' \Rightarrow V_1' = -V_1 + V_2 + V_2' \quad (2)$$

$$V_1' = -3 \text{ m/s} + V_2'$$

$$m_1 V_1 + m_2 V_2 = m_1 (-3 \text{ m/s} + V_2') + m_2 V_2'$$

$$m_1 V_1 + m_2 V_2 + m_1 3 \text{ m/s} = V_2' (m_1 + m_2)$$

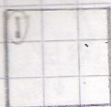
$$\frac{24 \text{ kg m/s} + 18 \text{ kg m/s} + 12 \text{ kg m/s}}{10 \text{ kg}} = V_2'$$

$$V_2' = 5.4 \text{ m/s} \quad \checkmark$$

$$V_1' = -3 \text{ m/s} + 5.4 \text{ m/s} \Rightarrow V_1' = 2.4 \text{ m/s} \quad \checkmark$$

3

$$m_1 = 5 \text{ kg} \quad V = 3 \text{ m/s}$$



$$V = 1,5 \text{ m/s}$$



$$m = 10 \text{ kg}$$

ELÁSTICO (K=1)

$$m_1 V_1 - m_2 V_2 = m_1 V_1' + m_2 V_2'$$

$$m_1 V_1 - m_2 V_2 = m_1 (V_2' - 4,5 \text{ m/s}) + m_2 V_2'$$

$$m_1 V_1 - m_2 V_2 = m_1 V_2' - m_1 4,5 \text{ m/s} + m_2 V_2'$$

$$m_1 V_1 - m_2 V_2 + m_1 4,5 \text{ m/s} = V_2' (m_1 + m_2)$$

$$\frac{15 - 15 + 22,5}{15} = V_2' \Rightarrow \boxed{V_2' = 1,5 \text{ m/s}} \checkmark$$

$$K = -\frac{(V_1' + V_2')}{V_1 - V_2}$$

$$V_1 - V_2 = -V_1' + V_2'$$

$$V_2' - V_1 + V_2 = V_1'$$

$$V_2' - 4,5 = V_1'$$

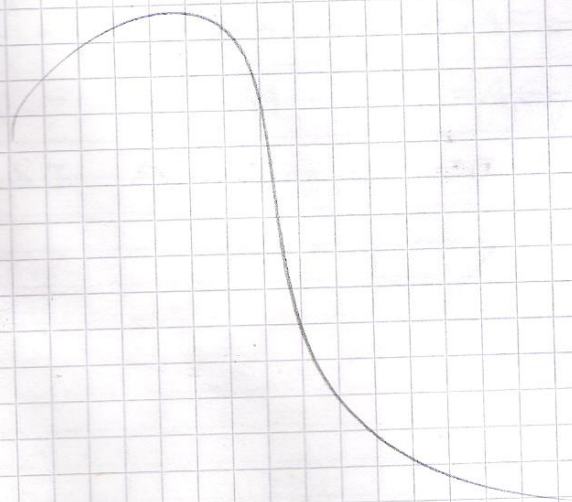
$$\boxed{V_1' = -3 \text{ m/s}} \checkmark$$

PLÁSTICO (K=0)

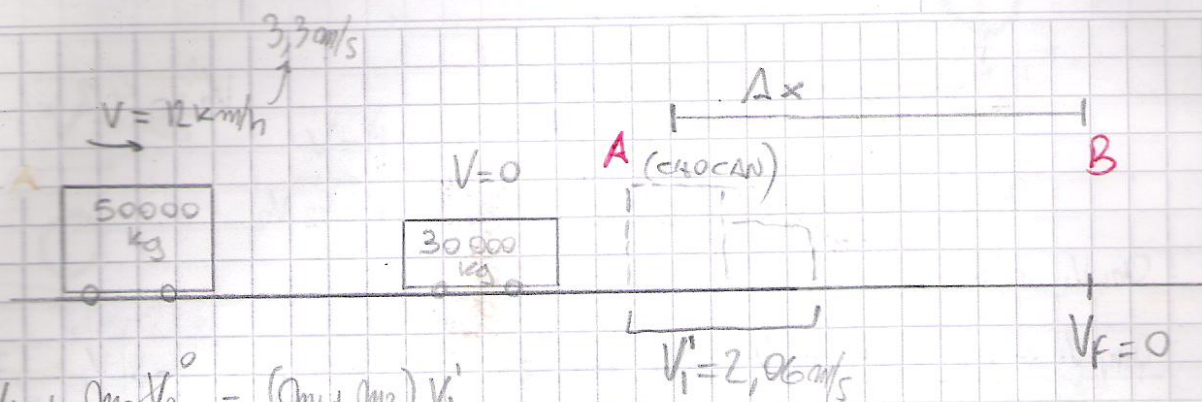
$$m_1 V_1 - m_2 V_2 = V_f (m_1 + m_2)$$

$$\frac{m_1 V_1 - m_2 V_2}{(m_1 + m_2)} = V_f$$

$$\frac{15 - 15}{15} = V_f \Rightarrow \boxed{V_f = 0} \checkmark$$



4



$$m_1 V_1 + m_2 V_2^0 = (m_1 + m_2) V_1'$$

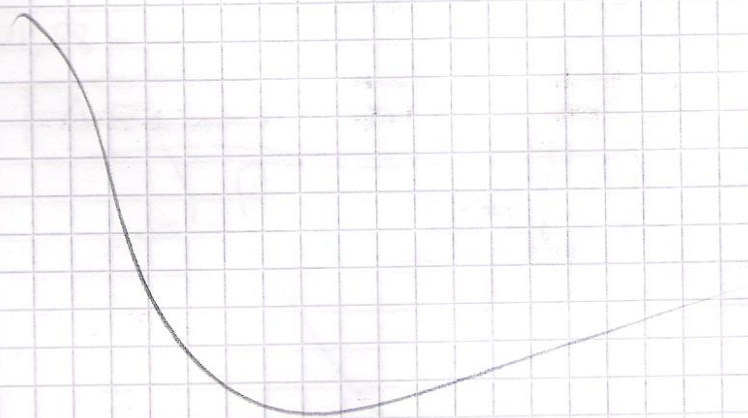
$$\frac{m_1 V_1}{(m_1 + m_2)} = V_1' \Rightarrow V_1' = 2.06 \text{ m/s}$$

(A) $E_{pA} = 0, E_{cA} \neq 0$; (B) $E_{pB} = 0, E_{cB} = 0$; $F_r = (m_1 + m_2) \cdot g \cdot 5\% = 40000 \text{ N}$

$$W_{FNC} = \Delta E_{\text{mech}} \Rightarrow W_{FNC} = E_{\text{mechB}} - E_{\text{mechA}}$$

$$F_r \cdot \Delta x \cdot \cos 180 = \frac{1}{2} (m_1 + m_2) (V_1')^2$$

$$\Delta x = \frac{40000 \cdot 4.24}{4000} \Rightarrow \Delta x = \frac{169600}{40000} \Rightarrow \Delta x = 4.24 \text{ m} \checkmark$$



5

$$V = 5 \text{ m/s}$$

$$V = 2 \text{ m/s}$$



$$m_1 = 2 \text{ kg}$$



$$m_2 = 3 \text{ kg}$$

$$V_2' = 4,2 \text{ m/s}$$

$$m_1 V_1 + m_2 V_2 = m_1 V_1' + m_2 V_2'$$

$$m_1 V_1 + m_2 V_2 = m_1 V_1' + m_2 V_2'$$

$$\frac{m_1 V_1 + m_2 V_2 - m_2 V_2'}{m_1} = V_1' \Rightarrow \frac{10 + 6 - 12,6}{2} = V_1' \Rightarrow V_1' = 1,7 \text{ m/s}$$

$$K = \frac{-V_1' + V_2'}{V_1 - V_2} \Rightarrow K = \frac{-1,7 \text{ m/s} + 4,2 \text{ m/s}}{5 \text{ m/s} - 2 \text{ m/s}} \Rightarrow K = \frac{2,5}{3} \Rightarrow K = 0,83$$

6

$$H = 1,5 \text{ m}$$

$$h = 1 \text{ m}$$



$$K = \frac{-V_1'}{V_1}$$

$$V_y = \sqrt{2g\Delta y}$$

$$\frac{4,42}{5,42}$$

$$V_{y_A} = \sqrt{2g\Delta y} \Rightarrow 5,47 = V_{y_A} \text{ or } V_1$$

$$\frac{4,47}{5,47}$$

$$V_{y_B} = -\sqrt{2g\Delta y} \Rightarrow -4,47 = V_{y_B} \text{ or } V_1'$$

BATUCAS

$$K = \frac{-V_1'}{V_1} \Rightarrow K = \frac{4,47 \text{ m/s}}{5,47 \text{ m/s}} \Rightarrow K = 0,81$$

7

$$V = 10 \text{ m/s}$$



$$m_1 = 2 \text{ kg}$$

$$V = 4 \text{ m/s}$$



$$m_2 = 1 \text{ kg}$$

$$V_1' = ?$$

$$V_2' = ?$$

$$\Delta E = ?$$

$$K = 0,7$$

$$m_1 V_1 + m_2 V_2 = m_1 V_1' + m_2 V_2'$$

$$m_1 V_1 + m_2 V_2 = m_1 (V_2' - 4,2 \text{ m/s}) + m_2 V_2'$$

$$m_1 V_1 + m_2 V_2 = m_1 V_2' - m_1 \cdot 4,2 \text{ m/s} + m_2 V_2'$$

$$m_1 V_1 + m_2 V_2 + m_1 \cdot 4,2 \text{ m/s} = V_2'$$

$$m_1 + m_2$$

$$\frac{20 + 4 + 8,4}{3} = V_2' \Rightarrow V_2' = 10,8 \text{ m/s}$$

$$K = -\frac{(V_1' - V_2')}{V_1 - V_2}$$

$$K = \frac{-V_1' + V_2'}{V_1 - V_2}$$

$$-V_2' + (V_1 - V_2) \cdot 0,7 = -V_1'$$

$$4,2 \text{ m/s} - V_2' = -V_1'$$

$$V_2' - 4,2 \text{ m/s} = V_1'$$

$$V_1' = 10,8 \text{ m/s} - 4,2 \text{ m/s} \Rightarrow V_1' = 6,6 \text{ m/s}$$

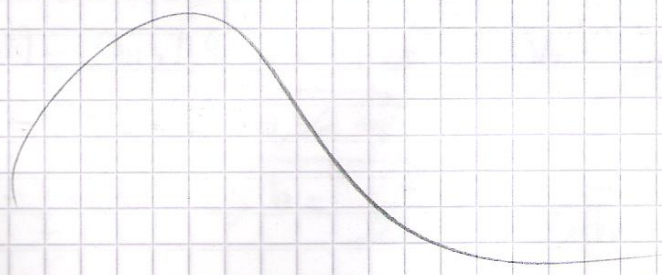
$$\Delta E_c = E_{cf} - E_{co}$$

$$\left(\frac{1}{2} m_1 (V_1')^2 + \frac{1}{2} m_2 (V_2')^2 \right) - \left(\frac{1}{2} m_1 (V_1)^2 + \frac{1}{2} m_2 (V_2)^2 \right)$$

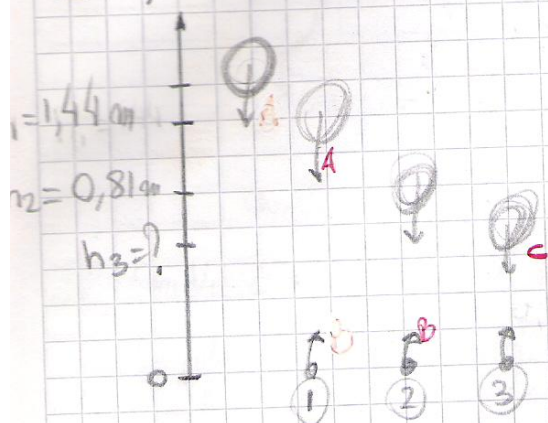
$$(43,56 + 58,32) - (100 + 8) = \Delta E_c$$

$$101,88 - 108 = \Delta E_c$$

$$\Delta E_c = -6,12 \text{ J}$$



8



$$v_i = v_A = \sqrt{2g\Delta y} \Rightarrow v_A = 5,36 \text{ m/s}$$

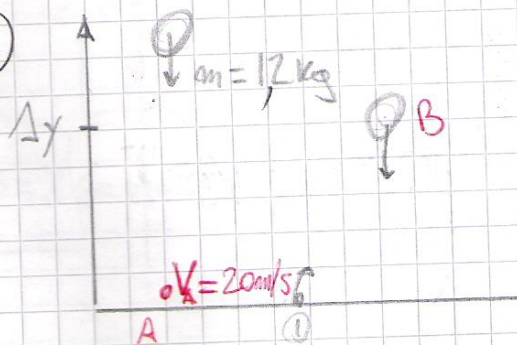
$$v_i = v_B = -\sqrt{2g\Delta y} \Rightarrow v_B = -4,02$$

$$K = \frac{-v_i'}{v_i} \Rightarrow K = \frac{4,02 \text{ m/s}}{5,36 \text{ m/s}}$$

$$K = 0,75$$

$$K = \frac{\sqrt{2g\Delta y_c}}{\sqrt{2g\Delta y_b}} \Rightarrow \left[\frac{\sqrt{2g\Delta y_b} \cdot K}{2g} \right]^2 = \Delta y_c \Rightarrow 0,45 \text{ m} = \Delta y_c = h_3$$

9



$$K = 0,9$$

$$K = \frac{-v_i'}{v_i} \Rightarrow K = \frac{\sqrt{2g\Delta y}}{v_A}$$

$$\frac{(K \cdot v_A)^2}{2g} = \Delta y$$

$$\Delta y = 16,2 \text{ m}$$

$$v_B = \sqrt{2 \cdot 9,8 \cdot 16,2 \text{ m}}$$

$$v_B = 18 \text{ m/s}$$

$$\Delta E_c = E_{cf} - E_{ci}$$

$$\Delta E_c = \frac{1}{2} m (v_B)^2 - \frac{1}{2} m (v_A)^2$$

$$\Delta E_c = 194,4 \text{ J} - 240 \text{ J}$$

$$\Delta E_c = -45,6 \text{ J}$$

3
3
2
2
1
1

3
2
2
2
2
0,5
0,5